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Laboratory surveillance of pyogenic and non-pyogenic streptococcal bacteraemia in England: 2019

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Laboratory surveillance of pyogenic and non-pyogenic streptococcal bacteraemia in England: 2019

The analyses in this report are based on data relating to diagnoses of pyogenic and non-pyogenic streptococcal bloodstream infections between 2010 and 2019 in England. Data for England was extracted from the Public Health England (PHE) Second Generation Surveillance System (SGSS), a voluntary surveillance database, on 30 November 2020.

Invasive group A streptococcal disease is notifiable in England and Wales under the Health Protection (Notification) Regulations 2010 [1]. Records of group A streptococcal (GAS) bacteraemia based on isolates submitted to the PHE Respiratory and Vaccine Preventable Bacteria Reference Unit (RVPBRU, Colindale) were merged with laboratory reports. Most of the data collection for this report is based on voluntary reporting systems and as such it is important to note that regional and temporal incidence rates can be affected by completeness of and local variations in reporting.

In England, laboratories are requested to submit data individually to SGSS, with reporting based on clinically significant isolates.

Beta-haemolytic pyogenic streptococci are classified according to the type of major surface polysaccharide antigen (Lancefield group), namely: group A (*Streptococcus pyogenes*), group B (*Streptococcus agalactiae*), group C (multiple zoonotic species plus the human species *Streptococcus dysgalactiae* subsp. *equisimilis*); group G (human and animal species *Streptococcus dysgalactiae* subsp. *equisimilis* and *Streptococcus canis*). Non-pyogenic streptococci are subdivided into groups: Mitis; Sanguinis; Anginosus; Salivarius; Mutans; Bovis. *Streptococcus pneumoniae* and group D streptococci (now classified as *Enterococcus* spp.) are not included in this report.

The report includes analyses on the trends, age and sex distribution, geographical distribution and antimicrobial susceptibility of laboratory-reported cases of pyogenic and non-pyogenic streptococcal bacteraemia. Rates of bacteraemia were calculated using mid-year resident population estimates for the respective year and geography [2]. Rates of GBS bacteraemia in infants were calculated using 2019 live birth denominators [3]. Geographical analyses were based on cases in England being assigned to one of 9 PHE Centres formed from administrative local authority boundaries.

Main trends

The following is a summary of trends in cases according to infection group (as depicted in figures 1a and 1b) and according to the age of cases (as depicted in figures 2 and 3):

- between 2014 and 2018 there was a 39% increase in the number of laboratory reports of streptococcal bacteraemia (from 13,012 to 18,057 reports) in England
- in 2019, 87% (15,796) of *Streptococcus* spp. isolates from blood were reported to species level
- the rate of group A streptococcal (GAS) bacteraemia decreased by 20% from 4.8 cases per 100,000 population in 2018 to 3.9/100,000 in 2019
- 2,311 cases of group B streptococcal (GBS) bacteraemia were reported by laboratories in England in 2019, a 4% decrease since 2018
- the rate of group C streptococcal (GCS) bacteraemia increased by 10% between 2018 and 2019, from 2.8 to 3.1 per 100,000 population
- 1,432 cases of group G streptococcal (GGS) bacteraemia were reported by laboratories in England in 2019, a 6% increase since 2018 and a 32% increase since 2015
- in line with previous reports, rates of pyogenic streptococcal bacteraemia were highest in the elderly, except for GBS where rates were highest in infants
- the overall rate of GBS disease in infants less than 90 days old in England increased from 0.82 to 0.84/1,000 live births between 2018 and 2019, with both early and late onset disease increasing (0.53 to 0.55 and 0.29 to 0.30 respectively)

Overall, between 2015 and 2019 there was a 39% increase in the number of laboratory reports of streptococcal bacteraemia (from 13,012 to 18,057 reports; table 1) in England, comprising a 38% increase in pyogenic (5,545 to 7,639) and a 40% increase in non-pyogenic streptococcal bloodstream infections (7,467 to 10,418). In 2019, 87% (15,796/18,057) of *Streptococcus* spp. isolates from blood (excluding *S. pneumoniae*) were reported to species level.

Table 1. Reports of pyogenic and non-pyogenic streptococcal bacteraemia by species in England; 2015 to 2019

	2015		2016		2017		2018		2019	
	No.	%	No.	%	No.	%	No.	%	No.	%
Pyogenic streptococci	5,545	100	6,095	100	6,988	100	7,336	100	8,643	100
Group A	1,753	32	1,976	31	1,984	30	2,694	34	2,172	28
Group B	1,765	32	2,019	32	2,123	32	2,331	29	2,311	30
Group C	942	17	1,159	18	1,305	19	1,553	20	1,724	23
Group G	1,085	20	1,201	19	1,307	19	1,348	17	1,432	19
Non-pyogenic streptococci	7,467	100	8,463	100	8,924	100	9,654	100	10,233	100
Anginosus group	1,026	14	1,242	15	1,418	15	1,499	15	1,655	16
<i>S. anginosus</i>	439	6	565	7	653	7	711	7	858	8
<i>S. constellatus</i>	256	3	326	4	379	4	441	4	402	4
<i>S. intermedius</i>	158	2	188	2	193	2	192	2	226	2
<i>S. milleri</i> group	147	2	145	2	171	2	146	1	160	2
<i>Streptococcus</i> group F	26	0	18	0	22	0	9	0	9	0
Bovis group	376	5	439	5	581	6	677	7	760	7
<i>S. alactolyticus</i>	50	1	54	1	51	1	65	1	64	1
<i>S. bovis</i> biotype ii	109	1	127	2	164	2	183	2	218	2
<i>S. bovis</i> untyped	110	1	157	2	239	3	310	3	356	3
<i>S. equinus</i>	14	0	17	0	25	0	21	0	23	0
<i>S. gallolyticus</i>	45	1	43	1	39	0	38	0	53	1
<i>S. infantarius</i>	48	1	41	0	63	1	60	1	46	0
Mitis group	1,652	22	1,920	23	2,183	24	2,278	23	2,592	25
<i>S. mitis</i>	964	13	1,092	13	1,272	14	1,312	13	1,425	14
<i>S. oralis</i>	667	9	879	10	879	10	927	9	1,119	11
<i>S. cristatus</i>	21	0	23	0	32	0	39	0	48	0

	2015		2016		2017		2018		2019	
	No.	%	No.	%	No.	%	No.	%	No.	%
Mutans group	94	1	79	1	116	1	117	1	119	1
<i>S. mutans</i>	91	1	79	1	111	1	116	1	118	1
<i>S. sobrinus</i>	3	0	1	0	5	0	1	0	1	0
Salivarius group‡	659	9	757	9	784	9	953	10	971	9
<i>S. salivarius</i>	614	8	691	8	629	7	743	8	723	7
<i>S. vestibularis</i>	43	1	66	1	155	2	209	2	246	2
Sanguinis group^α	941	13	1,129	13	1,393	15	1,588	16	1,666	16
<i>S. gordonii</i>	141	2	185	2	192	2	237	2	250	2
<i>S. parasanguinis</i>	439	6	523	6	691	8	820	8	881	8
<i>S. sanguinis</i>	359	5	417	5	502	5	521	5	526	5
Other streptococci	2,719	36	2,897	34	2,705	29	2,698	28	2,655	25
'Anaerobic <i>Streptococcus</i> '	47	1	54	1	43	0	27	0	19	0
<i>S. acidominimus</i>	15	0	7	0	2	0	1	0	2	0
<i>S. suis</i>	5	0	-	-	2	0	2	0	2	0
<i>S. uberis</i>	3	0	3	0	3	0	3	0	1	0
Streptococci not fully identified	2,105	28	2,248	27	2,298	25	2,314	24	2,261	22
<i>Streptococcus</i> spp., other named [‡]	538	7	582	7	357	4	346	4	365	4

‡ total includes those recorded as '*S. hyointestinalis*' without further information

^α total includes those recorded as '*S. massiliensis*' without further information

[‡] including: *Streptococcus thermophilus*, *Streptococcus infantis*, *Streptococcus lutetiensis*, *Streptococcus pluranimalium*, *Streptococcus pasteurianus*, *Streptococcus ovis*, *Streptococcus peroris*, *Streptococcus sobrinus*, *Streptococcus australis*, *Streptococcus pseudoporcinus*, *Streptococcus thoralensis*, *Streptococcus peroris*, *Streptococcus porcinus*

[†] total includes those recorded as 'nutritionally variant Streptococci' without further information

Figure 1a. Trends in pyogenic streptococcal bacteraemia reports, by group, per 100,000 population in England; 2010 to 2019

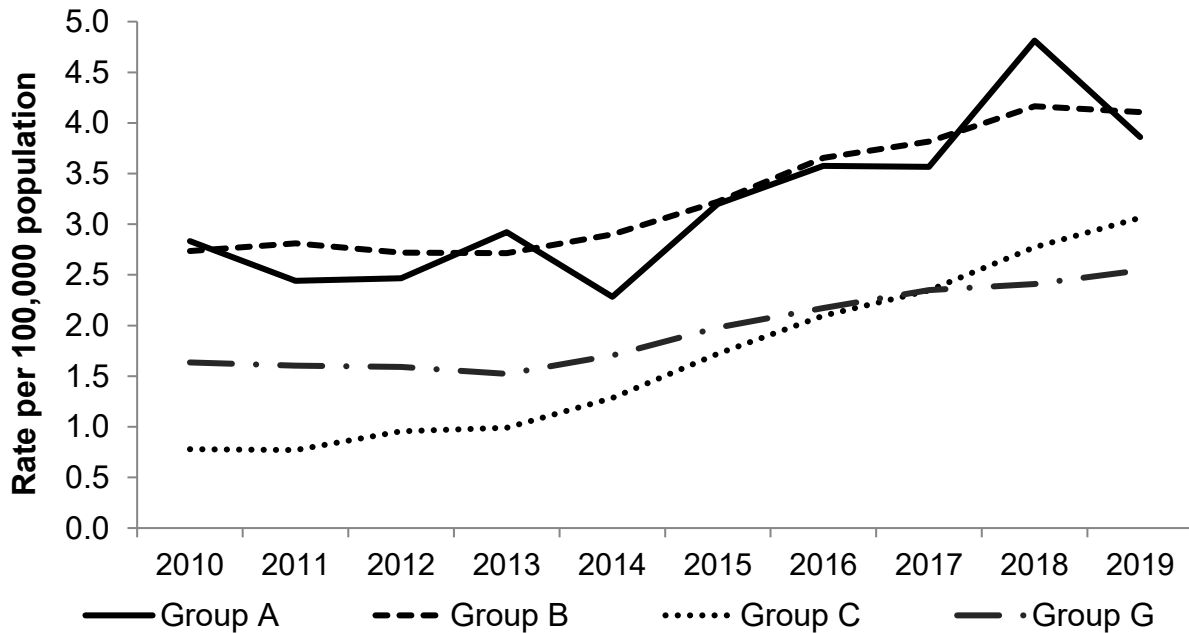
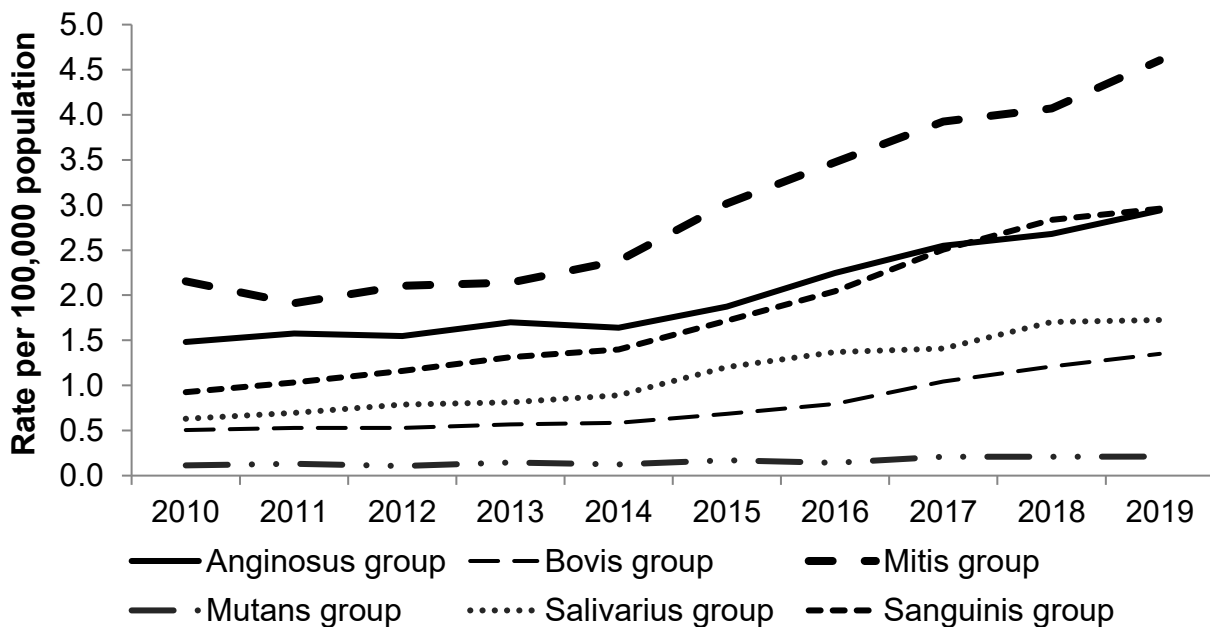


Figure 1b. Trends in non-pyogenic streptococcal bacteraemia reports per 100,000 population in England; 2010 to 2019



Pyogenic Streptococci

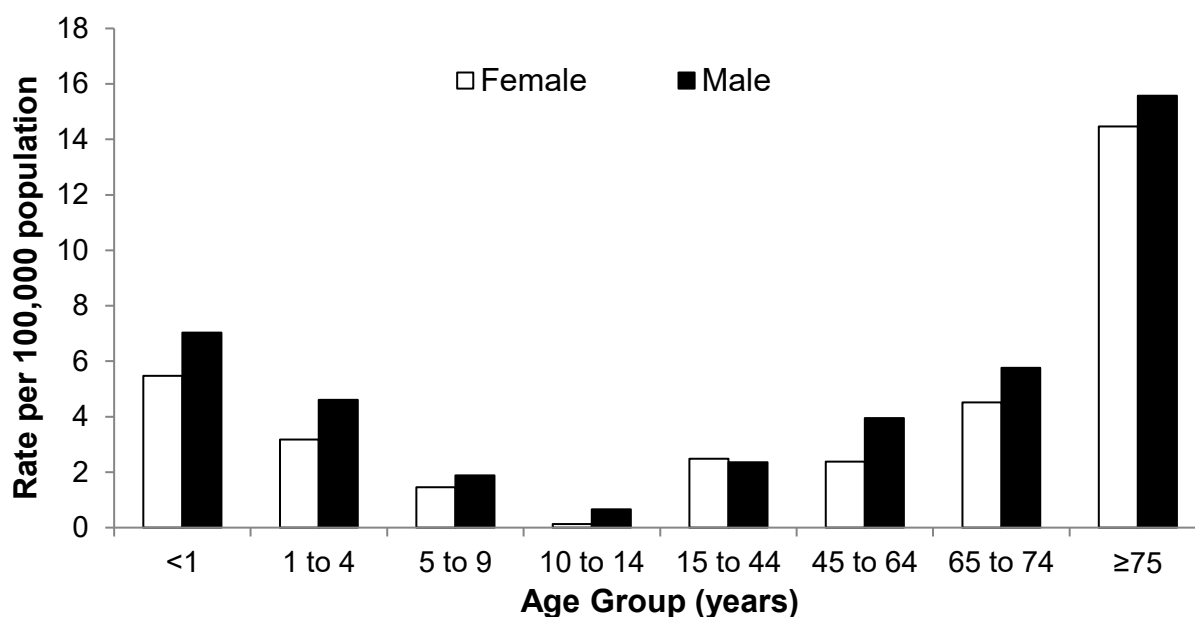
Table 2. Rate per 100,000 population of pyogenic streptococcal bacteraemia reports by Region and PHE Centre in England; 2019

Region	PHE Centre	Rate per 100,000 population			
		Group A	Group B	Group C	Group G
North of England	North East	4.2	4.1	5.5	0.4
	North West	4.0	3.9	1.8	2.5
	Yorkshire and Humber	5.1	3.7	3.8	2.6
Midlands and East of England	East Midlands	3.8	4.3	2.8	4.0
	East of England	3.3	4.1	2.6	3.4
	West Midlands	4.4	3.8	4.5	3.6
London	London	3.1	4.6	1.7	1.4
South of England	South East	3.8	3.9	3.7	1.9
	South West	4.0	4.8	3.7	3.1
England		3.9	4.1	3.1	2.5

Group A Streptococci

Of the pyogenic streptococci causing bacteraemia in England in 2019, group A streptococci (GAS) accounted for 28% (2,172/7,639) of reports (table 1). The overall rate of GAS bacteraemia in 2019 was 3.9 cases per 100,000 population (figure 1a), a 20% decrease from 4.8/100,000 in 2018. The rate of GAS bacteraemia reports across England in 2019 ranged from 3.1 in London to 5.1/100,000 in the Yorkshire and Humber regions (table 2).

Figure 2. Group A streptococcal bacteraemia age and sex rates per 100,000 population in England; 2019

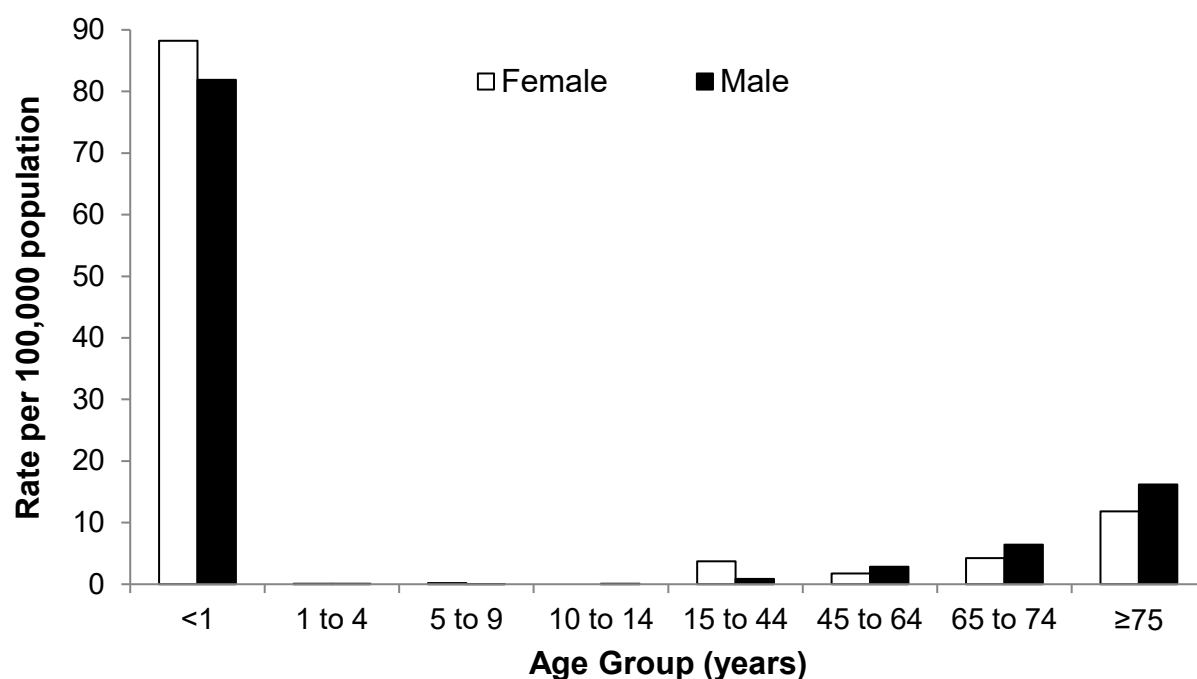


Rates of GAS bacteraemia were higher in males than females in all ages except the 15-44 years age group (figure 2). The highest rates were in the elderly (75+ years), with rates of 15.6/100,000 in males and 14.5/100,000 in females, followed by those under 1 year old, with rates of 7.0/100,000 in males and 5.5/100,000 in females.

Group B Streptococci

In 2019, 2,311 cases of GBS bacteraemia were reported by laboratories in England, a 31% increase compared to 2015 (table 1). GBS bacteraemia accounted for 30% of the pyogenic streptococcal bacteraemia reported in 2019. The rate of reported GBS bacteraemia in England was 4.1 per 100,000 population in 2019 (table 2), compared with 4.2/100,000 in 2018. Within England, the Yorkshire and Humber region reported the lowest rate of infection (3.7/100,000), and South West (4.8) and London (4.6) the highest.

Figure 3. Group B streptococcal bacteraemia age and sex rates per 100,000 population in England; 2019



Rates of GBS bacteraemia were highest in those aged less than one year, at 85.8 per 100,000 population (88.2 in females and 81.9/100,000 in males; figure 3). Rates were higher in males than females in the oldest age groups: 65 to 74 years, males 6.4/100,000, females 4.2/100,000; ≥75 years age group, males 16.2/100,000, females 11.8/100,000.

In infants under 90 days old the rate of GBS bacteraemia in England in 2018 was 0.84 per 1,000 live births (table 3), a slight increase compared with 2018 (0.82/1,000) [4].

In England, rates of early onset disease (<7 days old) were higher than late onset disease (7 to 90 days old) (0.55 compared with 0.30 per 1,000 live births). The rate of late onset disease increased slightly from 2018 (0.29 to 0.30/1,000 live births), as did the rate of early onset disease (0.53 to 0.55/1,000 live births).

Table 3. Number and rate per 1,000 live births of group B streptococcal bacteraemia in infants 0 to 90 days old in England; 2019

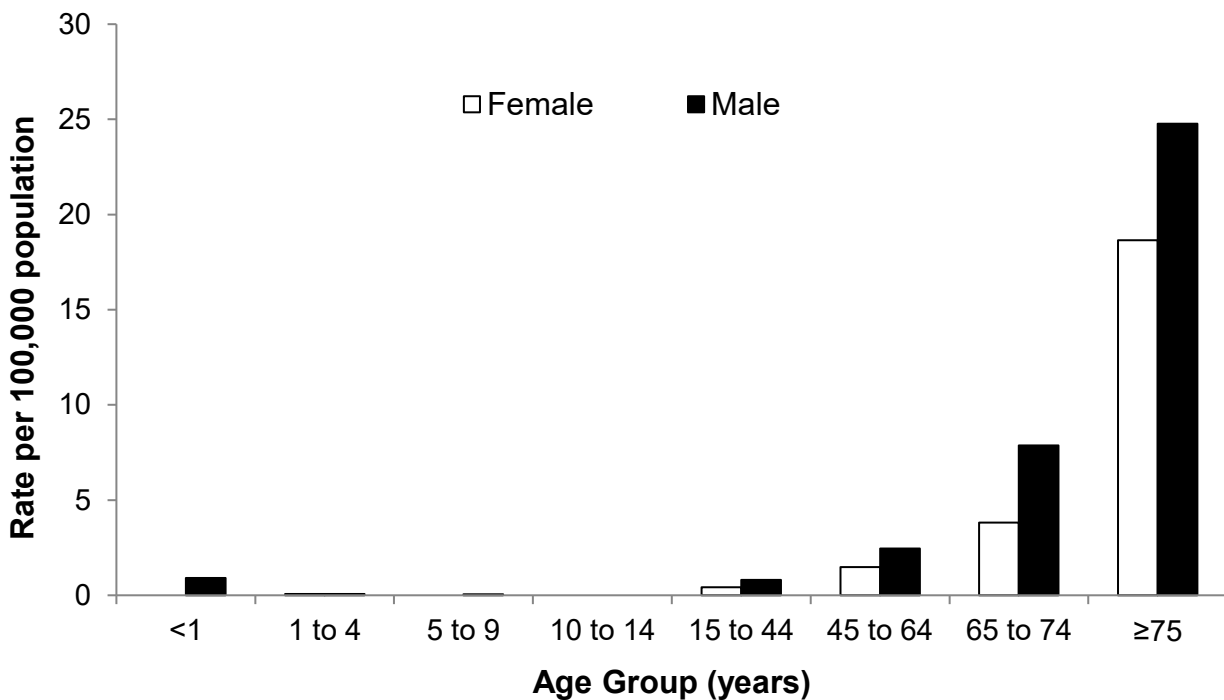
	All cases (0 to 90 days old)		Early onset (0 to 6 days old)		Late onset (7 to 90 days old)	
	No.	rate	No.	rate	No.	rate
England	526	0.84	341	0.55	185	0.30

Groups C and G Streptococci

The number of cases of GCS bacteraemia increased by 83% between 2015 and 2019 in England, from 942 to 1,724 reports (table 1). The rate of GCS bacteraemia in England was 3.1 per 100,000 population in 2019, more than 3 times the rate observed in 2010 (0.8/100,000) (figure 1a). The numbers of GGS bacteraemia reported in England increased 32% between 2018 and 2019 (from 1,348 to 1,432 reports), but the rate per 100,000 has increased 56% since 2010 (figure 1a), from 1.6/100,000 to 2.5/100,000 population (table 2).

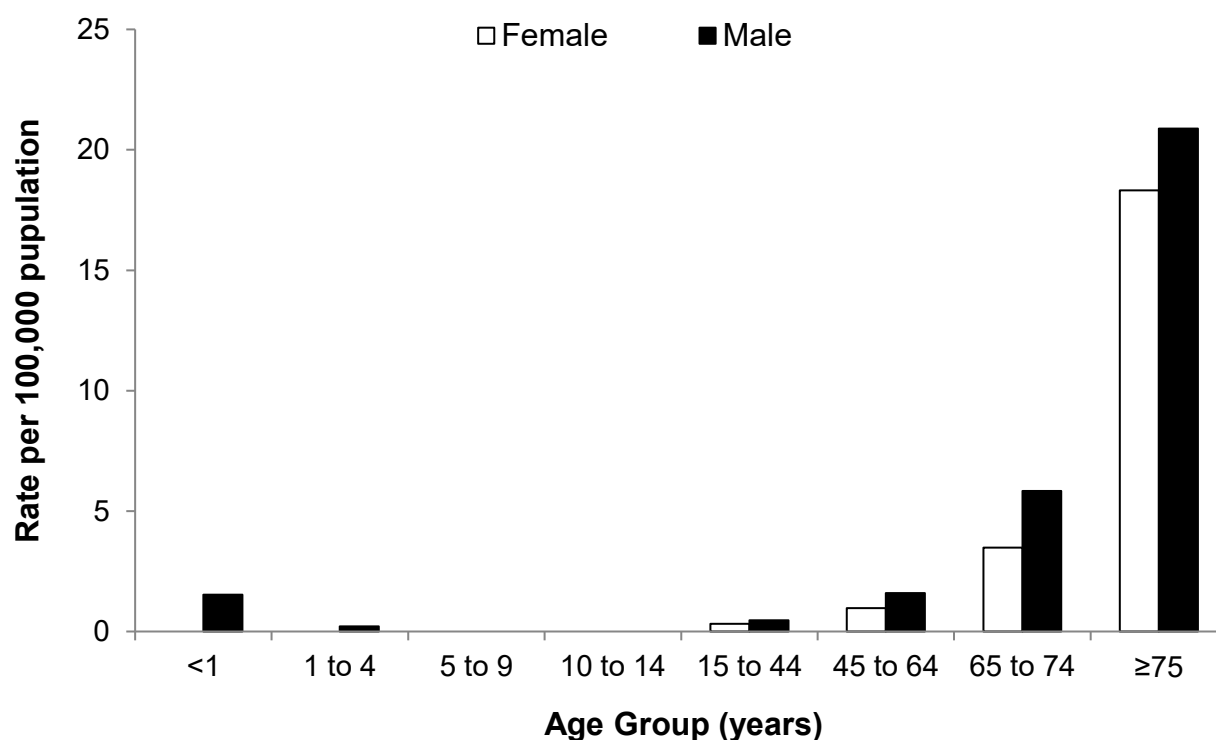
Within England, GCS bacteraemia rates ranged considerably by region, from 1.7/100,000 in London to 5.5 in the North East (table 2). Rates of GGS bacteraemia also varied substantially, ranging from 0.4/100,000 in the North East to 4.0/100,000 in the East Midlands.

Figure 4. Group C streptococcal bacteraemia age and sex rates per 100,000 population in England; 2019



Rates of GCS and GGS bacteraemia were highest in the 75 years and over age group for both species in 2019, 21.3/100,000 and 19.4/100,000 respectively (figures 4 and 5). Rates were higher in males than in females in all age groups.

Figure 5. Group G streptococcal bacteraemia age and sex rates per 100,000 population in England; 2019



Non-pyogenic Streptococci

The number of cases of non-pyogenic streptococcal bacteraemia reported in England has increased each year since 2015, with an overall 40% increase (from 7,467 to 10,418 reports; table 1). Rates increased in all the non-pyogenic groups in England between 2010 and 2019 (figure 1b), with the largest increases occurring in *Salivarius* and *Sanguinis* group streptococci (0.6 to 1.7, and 0.9 to 3.0 per 100,000 population, respectively).

Of the non-pyogenic streptococci, the rate of bacteraemia reports in England was highest for *Mitis* group streptococci (4.6 per 100,000 population; table 4), with the lowest rates for *Mutans* group (0.2/100,000).

Incidence rates for each of the non-pyogenic groups varied within England. *Anginosus* group bacteraemia rates ranged from 3.3 per 100,000 population in the East Midlands to 2.4/100,000 in the London region. Rates of *Mitis* group bacteraemia ranged from 5.8/100,000 in the North West to 3.9/100,000 in the East of England region.

Among all non-pyogenic streptococci bacteraemia reported in 2019 in England, the *Mitis* group accounted for the largest proportion of reports (25%); in this group, reports

increased by 57% (from 1,652 to 2,592 reports) between 2015 and 2019 (table 1). Increases in the number of non-pyogenic streptococcal bacteraemia reports were seen in all groups since 2015, with the greatest increases being seen in the Bovis (102%, from 376 to 760 reports) and Sanguinis (77%, from 941 to 1,666 reports) groups. Changes in distribution of less common non-pyogenic streptococcal species may in part be due to increasing use of matrix-assisted laser desorption/ionization time of flight (MALDI-ToF) analysis in hospitals, which allows for rapid species identification, facilitating reporting of species not previously recognised by clinical laboratories. It is of note that identification of *Streptococcus* to species level using MALDI-ToF alone is undergoing evaluation by the reference laboratory. Accurate species determination may not be achieved with this standalone test for all species, and this needs to be accounted for when species such as *S. alactolyticus*, *S. equinus*, *S. acidominimus* and *S. uberis*, amongst others, which are not usually associated with human infection, are currently being reported, and the isolate should be referred for a full identification.

It is also of note that the reference laboratory has detected *Streptococcus dysgalactiae* subspecies *equisimillis* (SDSE) with the 'A' surface antigen. These isolates would be reported as SDSE by laboratories that perform MALDI-ToF alone, and as GAS by laboratories that do not use MALDI-ToF and perform only Lancefield grouping on beta-haemolytic streptococci.

Figure 6. Anginosus group streptococcal bacteraemia age and sex rates per 100,000 population in England; 2019

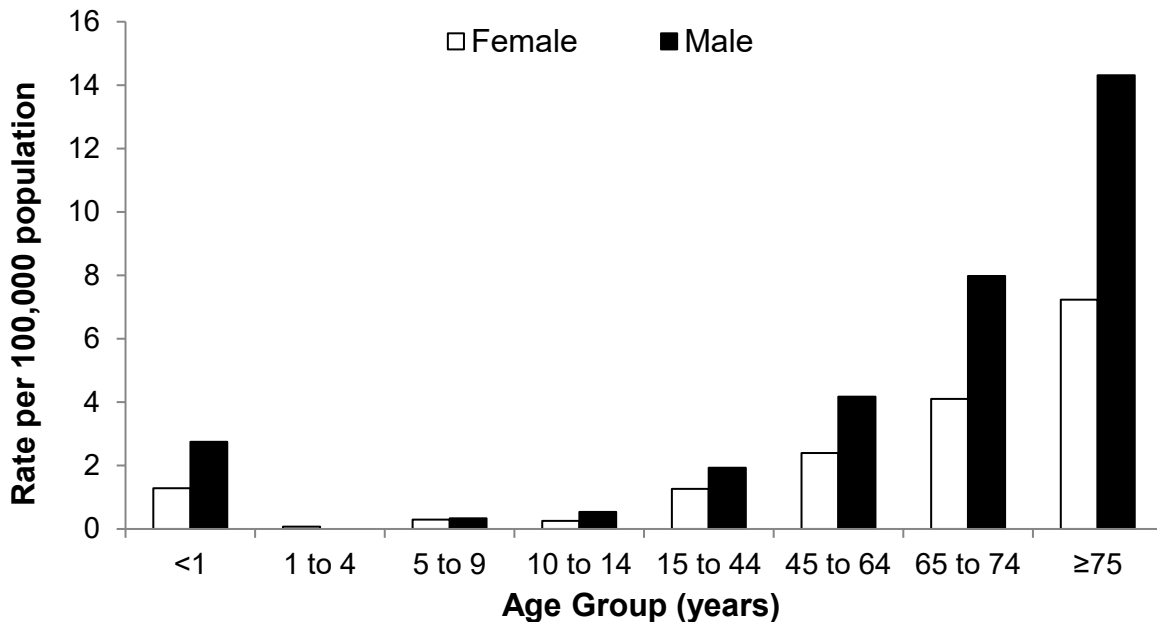


Table 4. Rate per 100,000 population non-pyogenic streptococcal bacteraemia reports by region and country (England); 2019

Region	PHE Centre	Rate per 100,000 population					
		Anginosus Group	Bovis Group	Mitis Group	Mutans Group	Salivarius Group	Sanguinis Group
North of England	North East	3.0	0.9	4.9	0.1	2.4	3.6
	North West	3.2	1.8	5.8	0.2	1.8	3.0
	Yorkshire & Humber	2.9	1.1	4.0	0.3	1.6	2.8
Midlands and East of England	East Midlands	3.3	1.0	4.1	0.2	1.3	2.1
	East of England	2.7	1.1	3.9	0.1	1.5	2.8
	West Midlands	3.1	2.4	5.0	0.4	2.1	3.6
London	London	2.4	1.1	4.7	0.1	1.6	2.5
South of England	South East	3.2	1.3	4.9	0.3	1.7	3.4
	South West	3.0	1.5	4.3	0.3	2.0	3.4
England		2.9	1.4	4.6	0.2	1.7	3.0

Figure 7. Bovis group streptococcal bacteraemia age and sex rates per 100,000 population in England; 2019

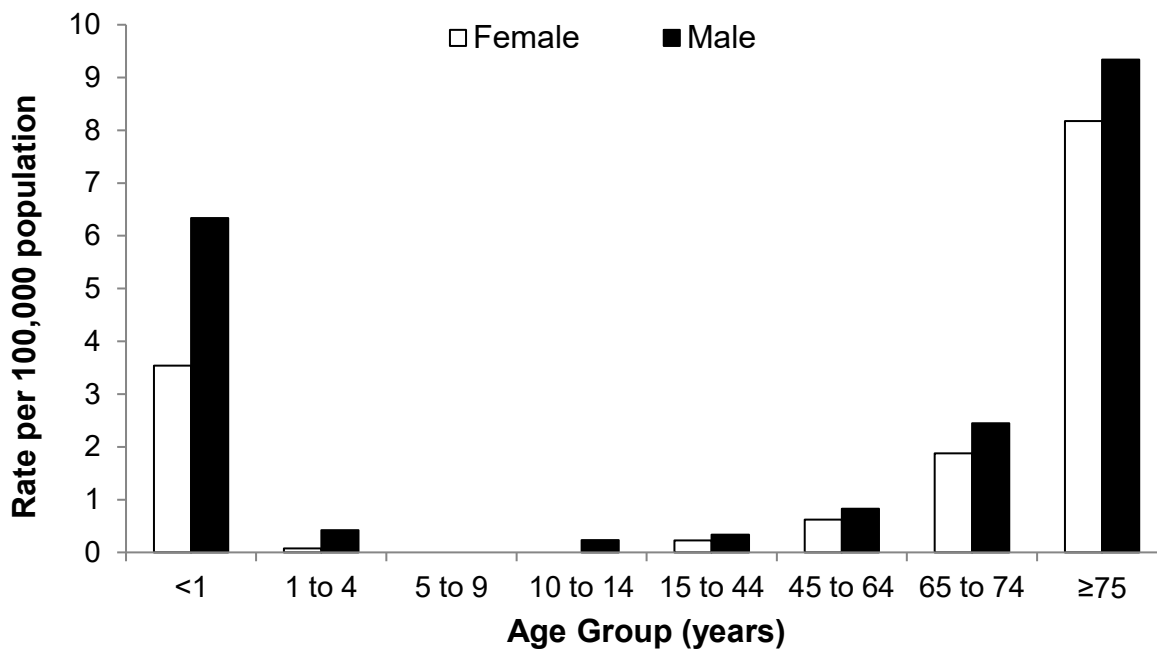


Figure 8. Mitis group streptococcal bacteraemia age and sex rates per 100,000 population in England; 2019

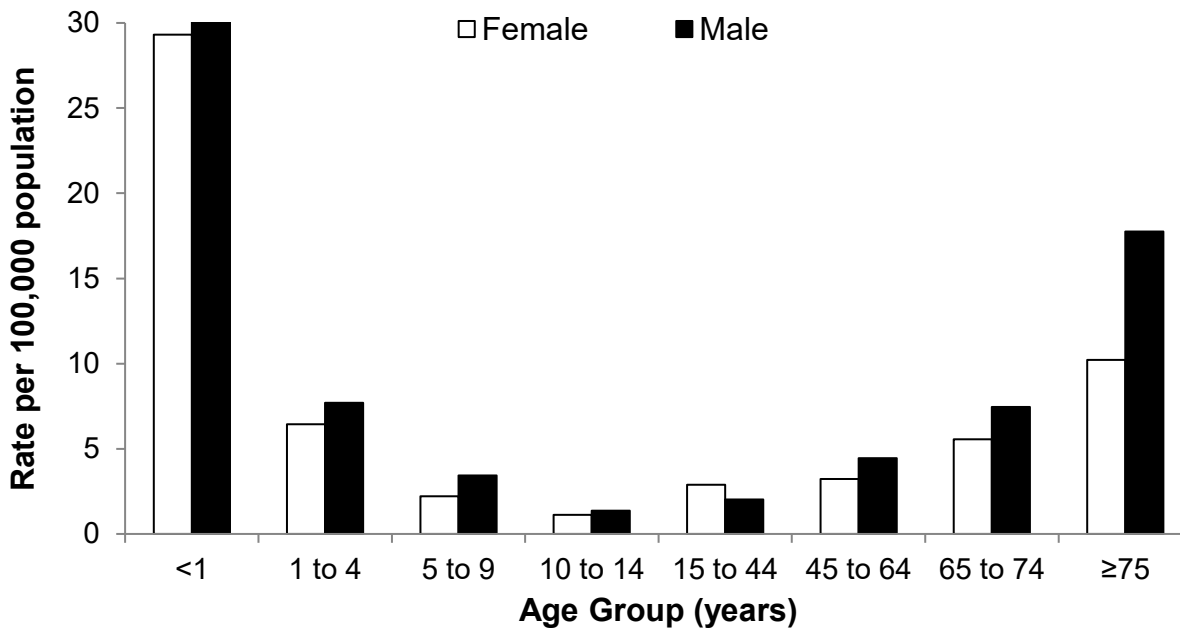


Figure 9. Salivarius group streptococcal bacteraemia age and sex rates per 100,000 population in England; 2019

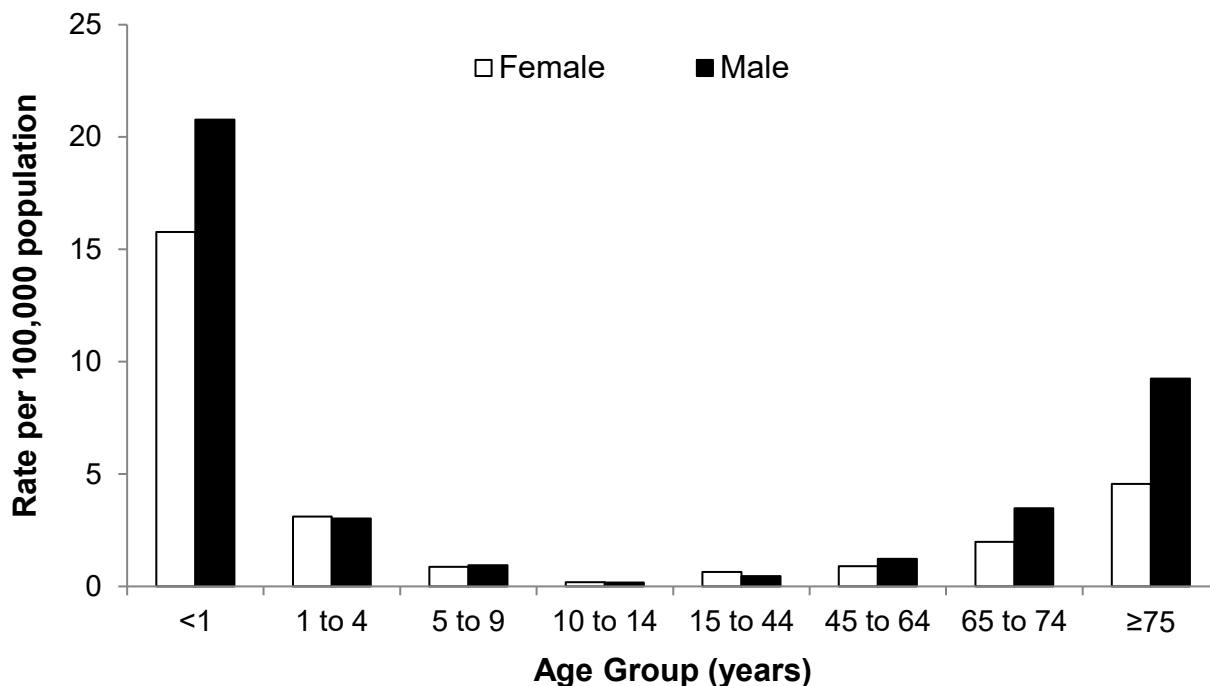
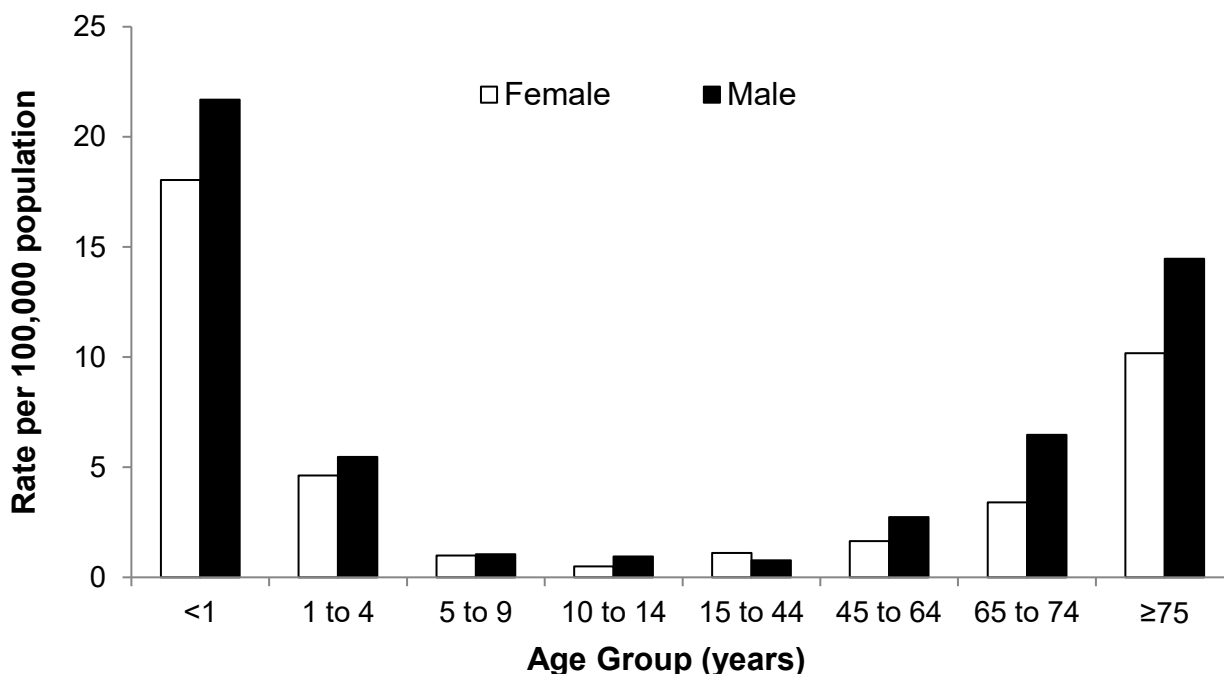


Figure 10. Sanguinis group streptococcal bacteraemia age and sex rates per 100,000 population in England; 2019



Distributions of non-pyogenic streptococcal bacteraemia reports by age and sex showed higher rates among males compared to females, and in the youngest (<1 year) and oldest age groups (figures 6 to 10). Rates were highest in those aged 75 years and above for Anginosus (figure 6) and Bovis (figure 7) streptococcal group bacteraemia

(10.3 and 9.6 per 100,000 population, respectively). In contrast, rates were highest in those aged under one year old for *Mitis* (31.5/100,000, figure 8), *Salivarius* (19.0/100,000, figure 9) and *Sanguinis* (19.9/100,000, figure 10) streptococcal groups.

Reference Microbiology Service

In 2019, the proportion of reports of streptococcal bacteraemia in which the organism was not fully identified was 13%. Precise species identification of isolates would improve the monitoring of trends in non-pyogenic streptococci and related genera. The Respiratory and Vaccine Preventable Bacteria Reference Unit (RVPBRU, Colindale) offers a referred (charged for) taxonomic identification service for streptococci and other related Gram-positive, catalase-negative genera from systemic and other significant infections. A free-of-charge reference service is available for urgent public health investigations. All such isolates should be submitted to RVPBRU along with all GAS, GBS, GCS and GGS isolates from normally sterile sites. A total of 87% of GAS episodes from bacteraemia were referred for typing, which trends are monitored and support public health investigations. Laboratories are requested to send any pyogenic streptococcal isolates exhibiting a decreased sensitivity to penicillin to the Antimicrobial Resistance and Healthcare Associated Infections Reference Unit (AMRHAI, Colindale) for confirmation. In addition, any streptococci (pyogenic or non-pyogenic) with suspected glycopeptide or linezolid resistance should be referred for further investigation. Both AMRHAI and RVPBRU are based at PHE, Colindale. Guidelines for the management of close community contacts of invasive GAS cases [6] and the prevention and control of GAS transmission in acute healthcare and maternity settings [7] are available at: www.gov.uk/government/publications/invasive-group-a-streptococcal-disease-managing-community-contacts

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